

Application Serial No. 10/763,500

Date May 16, 2005

Page 21 of 30

Reply to Office Action dated February 15, 2005

REMARKS

In the Office Action dated February 15, 2005, the Examiner objects to the drawing figures. The Examiner rejects claims 1-30 under 35 U.S.C. § 112, second paragraph, and under 35 USC §103(a). With this Amendment, claims 1, 2, 6-8, 10-23 and 28-29 are amended. No claims are added or canceled. After this Amendment, claims 1-30 remain pending in the Application. It is respectfully submitted that Applicants' invention as set forth in claims 1-30 includes features which are not suggested or rendered obvious by the cited references, taken in any permissible combination. Reconsideration is respectfully requested.

With this Amendment, several changes to the specification are submitted to correct typographical and spelling errors and to make the formulas and their format consistent between each other. Also, in paragraph [0021], language that is later repeated in paragraph [0022] is removed. In addition, a new sentence is added to paragraph [0021] to further describe the third and fourth flow valves 30, 32. This addition is supported by Figure 1 and by the remainder of paragraph [0021]. It is respectfully submitted that these changes to the specification add no new matter to the Application as filed and instead merely clarify the Application. The Examiner's approval of the proposed changes is respectfully requested.

The Examiner objects to the drawings under 37 C.F.R. 1.83(a), stating that means biasing the piston toward a centered position in claim 9 must be shown or the features canceled from the claim. It is respectfully submitted that this feature is shown in the drawing figures. In paragraph [0023], the Applicants describe the biasing means.

Various means can be provided for biasing the piston 18 toward the discreet (*sic*) centered position with respect to the housing 20. If only a single expandable fluid chamber is provided to be controlled by the present invention, the biasing means can include any suitable mechanical device, by way of example and not limitation, a return spring force. If two expandable fluid chambers 14, 16 are provided to be controlled by the system 10 according to the present invention, the biasing means corresponds to the second expandable fluid chamber.

Application Serial No. 10/763,500
Date May 16, 2005
Reply to Office Action dated February 15, 2005

Page 22 of 30

In the illustrate embodiment, the biasing means is one of the two expandable fluid chambers 14, 16 illustrated in Fig. 1. It is respectfully requested that the Examiner withdraw his objection to the drawing figures.

The Examiner rejects claims 1-30 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to point out and distinctly claim the subject matter that the Applicants regard as the invention. With respect to claims 1, 10, 19, the Examiner states that the phrase "at least one discrete position sensor located adjacent a midpoint of the fluid operated cylinder" is confusing since the disclosure indicates that there is only one position sensor located at the midpoint. The Applicants respectfully submit that although the disclosure only shows one sensor located in the specified location, claims are not limited to the disclosed embodiment. One skilled in the art would know that it would be possible to incorporate more than one sensor located in the specified location for any number of reasons, including redundancy, etc. The Applicants respectfully submit that this phrase would be clearly understood by one skilled in the art of the invention. Nonetheless, the Applicants have revised each of claims 1, 10 and 19 to state that the at least one discrete position sensor includes a first position sensor. Conforming changes have been made to dependent claims 2, 6, 7, 11, 15 and 20. Withdrawal of this basis for rejection is respectfully requested.

With respect to the Examiner's rejection of the language incorporating the control program, the Applicants believe that the Examiner's suggested language adds additional clarity to the claim and has revised claims 1, 19 (not 20 as pointed to by the Examiner) and 23 to conform to the Examiner's suggestion. In addition, dependent claims 7, 8, 11, 21, 22, 28 and 19 have been amended to conform to the revised language of the independent claims.. It is respectfully submitted that these claims are clear and definite and meet the requirements of 35 U.S.C. § 112, second paragraph.

The Examiner also rejects claims 2, 6, 11, 15 and 20, stating that "a fluid operated (*sic*) sensor located adjacent a midpoint" and other similar language is

Application Serial No. 10/763,500
Date May 16, 2005
Reply to Office Action dated February 15, 2005

Page 23 of 30

confusing since it seems to have been previously claimed. It is respectfully submitted that the conforming changes made to these claims as a result of the clarification of the at least one discrete position sensor in their respective independent claims renders this rejection moot.

Finally, the Examiner rejects claims 10-18, stating that the claim is characterized as a system, but the limitations are in the form of steps. The Applicants have revised the preamble of each of these claims to characterize the invention recited therein as a process. It is respectfully submitted that claims 10-18 are clear and definite and meet the requirements of 35 U.S.C. § 112, second paragraph.

The Examiner rejects claims 23, 25 and 26 under 35 USC § 103(a) as being unpatentable over Stephenson et al. in view of Rector et al. The Examiner states that Stephenson et al. teaches all the features of the invention except for at least one discrete position sensor associated with the fluid operated cylinder to be controlled for sensing a discrete position of the piston within the cylinder. The Examiner also notes that the controller is not operably connected to the at least one position sensor and that actuation of the at least two valves is not controlled in response position measured by the at least one position sensor. However, the Examiner states that Rector et al. teaches an apparatus for controlling a position of a fluid cylinder wherein a position sensor is connected to a controller such that a valve is controlled in response to the position measured by the position sensor for the purpose of reducing the speed when the piston nears the end of its stroke position.

The Applicants have revised claim 23 to clarify that the controller having the control program controls respective positions of the at least two valves in response to position measured by the at least one position sensor. It is first submitted that the Examiner has failed to note an important feature of Stephenson et al. The control program taught by Stephenson requires input 41, which is provided by an operator (col. 4, lines 26-44). Without this operator input the apparatus of Stephenson cannot function. The operator determines how the load 17 of the hydraulic system should be moved and indicates this with a joystick or the like,

Application Serial No. 10/763,500

Page 24 of 30

Date May 16, 2005

Reply to Office Action dated February 15, 2005

which produces input 41. Stephenson et al. fails to teach or suggest the addition of a position sensor as one is not needed for this control. In addition, modifying the apparatus of Stephenson as proposed by the examiner would impermissibly change its principle of operation. Stephenson is designed to operate according to instructions provided by an observer (operator), while the present invention is directed to a system for positioning a piston without an observer being present. MPEP 2143.01, citing In re Ratti, 270 F.2d 810, 123 USPQ 349 (CCPA 1959).

The addition of a sensor as taught by Rector et al. would not meet the claim limitation in any case. The present invention is directed to a position control system that operates without the need for a human operator. The control program of the present invention uses the one or more discrete position sensors to provide input(s) to a control program (Fig. 2) for positioning the piston without the participation of an observer. Merely providing the output of a discrete position sensor as a signal to line 41 of Stephenson et al. would not produce the present invention. In fact, the resulting apparatus would be non-functional. Furthermore, Rector et al. teaches a position sensor used only for slowing the piston as it approaches the limit of its stroke; it is not used to control the position of the piston. In other words, Rector et al. teaches only the control of piston speed, not piston position. Therefore, not all of the elements are taught by the combined references.

In addition, the cylinder control structure in Stephenson et al. discloses the use of bi-directional control valves that are operated by solenoids (col. 3, ll. 43-44) and pressure sensors for measuring the pressure in the hydraulic lines that are connected to the head and rod chambers (col. 3, ll. 61-63). The solenoid-operated valves allow for only on/off flow control and are not proportional flow valves as recited in the claims. The pressure sensors and valves are connected to a controller that receives an input from the pressure sensors and produces an output signal to the valves, thereby controlling the pressure in the head and rod chambers. The structure in Rector et al. discloses means 83 for de-energizing a valve 91 at a predetermined retracted position of the hydraulic cylinder that includes a position

Application Serial No. 10/763,500

Page 25 of 30

Date May 16, 2005

Reply to Office Action dated February 15, 2005

sensor 92 "positioned adjacent the hydraulic cylinder" that signals to the controller that the hydraulic cylinder is in the retracted position. (Col. 4, ll. 26-32). A proportional valve and a position sensor, not a pressure sensor, are used in the Rector et al. structure to control the fluid pressure in the chambers. (Col. 4, ll. 26-32). Applicant submits that it would not be obvious in view of Rector et al. to add a position sensor to the structure in Stephenson et al., which uses only pressure sensors. Furthermore, Applicants submit that Rector et al. does not teach one skilled in the art to replace the solenoid-operated valves in Stephenson et al. with actuator-operated proportional flow valves as disclosed in the present invention. It is respectfully submitted that claim 23 and its dependent claims are allowable over the prior art of record.

The Examiner rejects claim 30 under 35 USC § 103(a) as being unpatentable over Stephenson et al. in view of Rector et al. and further in view of Neilson et al. The Examiner states that the combination of Stephenson et al. and Rector et al. teaches all of the features of claim 23, from which claim 30 depends. The Examiner then points to Neilson et al., stating that Neilson et al. teaches means for biasing the piston towards the midpoint position and concluding that this fact makes it obvious to include this feature of Neilson et al. in the combination "as a matter of engineering expediency." It is respectfully submitted that the Examiner is engaging in impermissible hindsight. Neilson et al. teaches the recited feature because it is needed as part of the operation of the particular apparatus taught in Neilson et al.; it neither teaches nor suggests that such biasing means is needed as part of every apparatus involving a piston. Stephenson et al. neither teaches nor suggests such a feature is desirable or needed. Unless the prior art teaches or suggests the desirability of a feature, the inclusion of that feature in a combination is not obvious. The Examiner suggests that this motivation exists because the cylinders of Stephenson et al. and Neilson et al. are functionally equivalent in the piston art. It is respectfully submitted that even if this unsupported statement by the Examiner were true, that still does not provide any motivation to combine these references as

Application Serial No. 10/763,500

Page 26 of 30

Date May 16, 2005

Reply to Office Action dated February 15, 2005

suggested. The issue is not whether the cylinders are interchangeable, but whether or not it would have been obvious to one skilled in the art to include means for biasing the piston of Stephenson et al. toward the midpoint position. There is no such motivation in either Stephenson et al. or Neilson et al. Thus, in addition to its dependency from claim 23, which is allowable as discussed above, claim 30 is allowable over the prior art of record.

The Examiner rejects claims 1-4, 10-13 and 19 under 35 USC § 103(a) as being unpatentable over Stephenson et al. in view of GB 2203195. With respect to claim 1 and its dependent claims and claim 10 and its dependent claims, it is respectfully submitted that the Examiner has mischaracterized the teachings of GB 2203195. Nowhere does GB 2203195 teach or suggest a first position sensor located adjacent a midpoint of the fluid operated cylinder. The Examiner points to sensors 25 and 26 as being first and second position sensors. However, the position sensor 25 produces a sensor signal in the retracted position of the piston 11, while the position sensor 26 is so arranged that it produces a sensor signal shortly prior to the time at which outwardly moving piston rod engages a workpiece 27. See p. 6. The Examiner has assumed, without a teaching or suggestion in GB 2203195, that one of these sensors is at a midpoint of the cylinder. In fact, this assumption is contrary to the teachings of GB 2203195 described above. No one skilled in the art would design a piston so that less than half of its stroke length was not used for useful work, i.e., it is not engaged with the workpiece 27 until after it passes the sensor 26. (Note that Fig. 1 is clearly not to scale.)

Furthermore, even if GB 2203195 taught the features on which the Examiner relies, the Examiner does not provide any motivation from the prior art itself for the proposed combination. The Examiner states that it would have been obvious to include the at least one discrete position sensor for the purpose of reducing the speed of the piston when it nears the end of its stroke position as taught by GB 2203195. As mentioned above with respect to Stephenson et al., there is no teaching or suggestion to include at least one position sensor in Stephenson et al.

Application Serial No. 10/763,500
Date May 16, 2005
Reply to Office Action dated February 15, 2005

Page 27 of 30

itself. Further, this purported motivation in GB 2203195 is not supported by the reference. The position sensor 26 is used when the piston approaches the workpiece 27, not the end of stroke, for the purpose of affecting "a gentle engagement at reduced speed[, which] is necessary in order to reduce consumption of the electrode and the production of sparks." See p. 7, ll. 6-11. No such danger exists in Stephenson et al. Therefore, this motivation is not sufficient to prompt the inclusion of the feature in Stephenson et al. In addition, the purported motivation is no motivation at all for including a sensor located adjacent a midpoint of the fluid operated cylinder to be controlled.

For all the foregoing reasons, claims 1-4, 10-13 and 19, and other claims dependent from claims 1, 10 and 19 are allowable over the prior art of record.

The Examiner also rejects claims 23-26 under 35 USC § 103(a) as being unpatentable over Stephenson et al. in view of GB 2203195. Similar to the combination of Stephenson et al. and Rector et al. discussed above with respect to claim 23, the proposed combination fails to teach or suggest the feature of a controller having a control program operably connected to the at least two valves and the least one position sensor for controlling respective positions of the at least two valves in response to position measured by the at least one position sensor. As mentioned, Stephenson et al. requires an operator input 41, or it cannot function. A position sensor is not needed for this control. GB 2203195 uses the position sensors to control piston motion in a pre-defined manner (to engage a tool) but lacks the control program of the present invention, which can reposition the piston to any position within the bore in response to the position of the piston. GB 2203195 teaches a position sensor used for slowing the piston as it approaches engagement with a workpiece; it is not used to control the position of the piston. Moreover, and as described above with reference to the Examiner's proposed combination of Stephenson et al. and GB 2203195, there is no teaching or suggestion in the art to combine these references in any case. It is respectfully submitted that claim 23 and its dependent claims are allowable over the prior art of record.

Application Serial No. 10/763,500

Page 28 of 30

Date May 16, 2005

Reply to Office Action dated February 15, 2005

The Examiner rejects claims 1-8, 10-17 and 19-22 under 35 USC § 103(a) as being unpatentable over Stephenson et al. in view of Morita et al. and Rector et al. Morita et al. discloses a pneumatic cylinder body with four position sensors, two in the center and one on each end of travel, that detect the position of the piston. (Col. 5, ll. 12-18). Signals from the position sensors are sent to the controller that in turn operates the solenoid valves. (Col. 5, ll. 34-45). The solenoid valves can be in an on or an off state depending on the input received by the controller, but the solenoid valves do not allow for proportional flow control (col. 4, ll. 20-56) as recited in the present claims. Applicant submits that it would not be obvious in view of Rector et al. and Morita et al. to replace the solenoid valves with on/off flow control in the Stephenson et al. structure with actuator valves with proportional flow control as disclosed in the present invention. The structure in Morita et al. also discloses the use of position sensors only, not pressure sensors. Applicant submits that it would not be obvious in view of Rector et al. and Morita et al. to add a position sensor to the midpoint of the cylinder housing for sensing positions of the piston to the Stephenson et al. structure, which uses pressure sensors for controlling fluid flow to the chambers. Since the structures in Stephenson et al. and Morita et al. both utilize solenoid valves to control fluid flow in the cylinder chambers, the combination of references does not teach proportional flow control using actuators. It is respectfully submitted that none of the cited references teach or suggest the combination of features recited in claims 1-8, 10-17 and 19-22.

The Examiner rejects claims 23-29 under 35 USC § 103(a) as being unpatentable over Stephenson et al. in view of Morita et al. and Rector et al. For the reasons discussed above, the recited combination fails to teach or suggest the feature of claim 23 and its dependent claims of at least two electrically actuated proportional flow valves connected to each port of the fluid operated cylinder to be controlled for selectively and proportionally controlling fluid flow into and out of the at least one fluid chamber of the fluid operated cylinder to be controlled. Similarly, the combination fails to teach or suggest at least one discrete position sensor associated

Application Serial No. 10/763,500

Page 29 of 30

Date May 16, 2005

Reply to Office Action dated February 15, 2005

with the fluid operated cylinder to be controlled for sensing a discrete position of the piston within the cylinder. Finally, the combination fails to teach or suggest the feature of claim 23 of a controller having a control program operably connected to the at least two valves and the least one position sensor for controlling respective positions of the at least two valves in response to position measured by the at least one position sensor. Thus, the invention of claims 23-29 is patentable over the prior art of record.

In addition to the foregoing, it is respectfully submitted that the Examiner has proposed a combination, Stephenson et al. and Morita et al. and Rector et al., that fails to render dependent claims 8, 17, 22 and 29 obvious. The Examiner states that Morita et al. calculates a required pressure to move the piston a desired distance from the midpoint position for the purpose of stopping the piston at its end of stroke position in a shock free state, without requiring any position adjustment of the position sensors. However, the Examiner has mischaracterized the teachings of Morita et al. Morita et al. supplies a single pressure to move a piston until a time for deceleration is determined, when the pressure is again changed until the end point is reached, and the pressure is discontinued. Morita et al. does not calculate these pressures and does not control the valves to obtain these calculated pressures. Thus, each of these claims is allowable based upon the unique features recited therein in addition to their dependency from allowable claims.

The Examiner rejects claim 30 under 35 USC § 103(a) as being unpatentable over Stephenson et al. in view of Morita et al. and Rector et al. and further in view of Neilson et al. Claim 30 depends from claim 23 and is thus allowable by dependency from an allowable claim as discussed above. In addition, it is respectfully submitted that the addition to Neilson et al. to the proposed combination fails to teach or suggest the features of claim 30 for the reasons stated above with respect to the Examiner's rejection based upon the combination of Stephenson et al., Rector et al. and Neilson et al.

It is respectfully submitted that this Amendment traverses and

Application Serial No. 10/763,500

Date May 16, 2005

Page 30 of 30

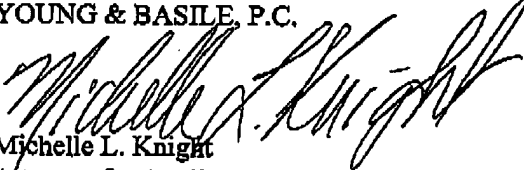
Reply to Office Action dated February 15, 2005

overcomes all of the Examiner's objections and rejections to the application as originally filed. It is further submitted that this Amendment has antecedent basis in the application as originally filed, including the specification, claims and drawings, and that this Amendment does not add any new subject matter to the application. Reconsideration of the application as amended is requested. It is respectfully submitted that this Amendment places the application in suitable condition for allowance; notice of which is requested.

If the Examiner feels that prosecution of the present application can be expedited by way of an Examiner's amendment, the Examiner is invited to contact the Applicants' attorney at the telephone number listed below.

Respectfully submitted

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